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(72)Inventor : FURUTA SEIICHI

(54) WIRELESS COMMUNICATION SYSTEM

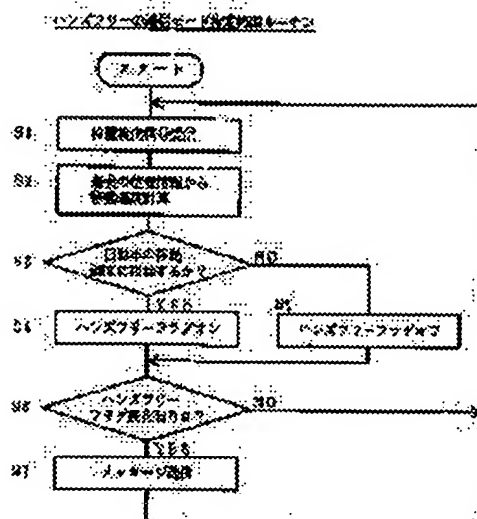
(57)Abstract:

PROBLEM TO BE SOLVED: To use a mobile phone, without the need for setting a hands-free communication mode on all occasions, when the driver drives an automobile.

SOLUTION: The mobile phone capable of making a speech in the hands-free communication mode is integrated with a GPS receiver, and periodically transmits its own position information to a base station. The base station obtains a moving speed of the object mobile phone, on the basis of position detection signals received at least twice (S1, S2), sets a hands-free flag, when the moving speed is equivalent to a moving speed of an automobile (S3, S4), and transmits a message

denoting a change in the flag setting to the mobile phone

(S6, S7). When the mobile phone receives an incoming call, the base station designates the hands-free communication mode to the mobile phone, so as to allow the mobile phone to make a speech in the mode.



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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the radio communications system which was made to communicate by connecting with a radio network through a base station from the radio communication equipment.

[0002]

[Problem(s) to be Solved by the Invention] As this kind of a radio communication equipment, ~~using it during driving of a vehicle, etc. in consideration of safety is forbidden law in the portable telephone.~~ For this reason, corresponding to arrival of the mail, drive mode is set up or there is a portable telephone with which it had the function of setting up handsfree mode.

[0003] However, he may operate by riding in an automobile in the condition [having put the portable telephone into a bag, a handbag, or a pocket] in fact, and forgets a setup of a mode switch in many cases. Although it is a useful function, the actual condition has become that he tends to forget to set up a mode switch at every operation, or it tends to neglect from troublesomeness.

[0004] This invention was made in view of the above-mentioned situation, and the purpose is in offering the radio communications system ~~which enabled it to talk over the telephone in handsfree mode automatically at the time of arrival of the mail on the occasion of an automobilism in the radio communication equipment equipped with the handsfree function.~~

[0005]

[Means for Solving the Problem] If a radio network side ~~detects the migration condition of the radio communication equipment~~ when those who possess a radio communication equipment ~~are moving in driving of a vehicle etc.~~ according to invention of claim 1 Since it comes to make the communicate mode by handsfree communicate by specifying that it carries out preferentially to a radio-communication-equipment side ~~It can communicate by being automatically handsfree,~~ without using the hand which those who possess a radio communication equipment are operating, and it can communicate, without lifting the hand of a steering wheel, and improvement in safety can be aimed at now by this.

[0006] in this case, that those who possess a radio communication equipment set it as the handsfree communicate mode beforehand corresponding to the condition under operation etc. can prevent now the accident which occurs when the call for carrying out by being alike occasionally, forgetting, and communicating in such the condition is received.

[0007] Since according to invention of claim 2 the location detecting signal of a location detection means is received through the radio communication equipment and detection of the migration condition of the radio communication equipment from a radio network side is judged in the above-mentioned configuration, the information on a location that it changes every moment can detect the migration condition.

[0008] ~~Since a migration condition is detectable from a radio network side in the above-mentioned configuration using the location detecting signal by making into a location detection means the position sensor prepared in the radio communication equipment at one~~ according to invention of claim 3, a

~~migration condition can be detected only by unlike the case where the position sensor prepared in mobiles, such as a vehicle, is used, possessing a radio communication equipment and riding on a mobile.~~

[0009] Since the GPS equipment for location detection, the location detection means for mobiles, for example, the car navigation equipment etc., carried in the mobile, etc. is used as a location detection means in invention of above-mentioned claim 2 according to invention of claim 4, it is not necessary to add a location detection means to the configuration of a radio communication equipment, and the above-mentioned function can be attained, considering as an easy configuration.

[0010] Since it detects at a radio network side by carrying out manual reception of the detecting signal from migration detection means, such as ~~a rotation sensor which detects rotation of the speed sensor and the wheels which detect the migration condition of a mobile~~, for the migration condition of a radio communication equipment in invention of claim 1, through a radio communication equipment according to invention of claim 5, the migration condition of a radio communication equipment can detect without preparing the migration detection sensor of dedication separately.

[0011] Since change of receiving reinforcement is recognized as change of both distance and it detects to a radio network side in invention of claim 1 based on change of the receiving reinforcement of the electric wave of the communication link which performs the migration condition of a radio communication equipment between the radio communication equipment according to invention of claim 6, it can carry out without preparing a configuration special to a radio-communication-equipment side.

[0012] Since according to invention of claim 7 the time alignment signal of the communication link which uses the migration condition of a radio communication equipment in the radiotelephony network as a radio network etc. is used and it detects by change of the amount of amendments of a signal, change, i.e., the migration condition, of the location, the migration condition of a radio communication equipment can be detected without preparing a special configuration.

[0013] Since it detects by change of positioning of migration of a radio communication equipment in invention of claim 1 with the configuration which performs the communication link between a radio network and a radio communication equipment with a W-CDMA method according to invention of claim 8, the migration condition of a radio communication equipment can be detected without preparing a special configuration.

[0014] According to invention of claim 9, in each above-mentioned invention, a cancellation means is formed in a radio communication equipment. Since it enabled it to cancel assignment of the handsfree communicate mode when the response which is not the communicate mode of handsfree [the case where the user has not operated the car etc. when arrival which specified the handsfree communicate mode from the radio network is carried out] was possible In spite of having not operated, when it is automatically specified as the handsfree communicate mode from a radio network side While this could be canceled, the usual communication link could be performed and safety was secured to communicate by the handsfree communicate mode, it should excel also in user-friendliness.

[0015]

[Embodiment of the Invention] (1st operation gestalt) It explains, referring to drawing 1 thru/or drawing 5 hereafter about the 1st operation gestalt at the time of applying this invention to a portable telephone. As the whole radio communications system of this invention is shown roughly, many base stations 2a-2c etc. are connected to the cellular-phone network 1 as a radio network, and drawing 2 carries the communication link with the portable telephone 3 which exists in the communications area of each base stations 2a-2c and mentions it later, it also performs assignment actuation of the communicate mode.

[0016] When a portable telephone 3 carries out button grabbing which is not illustrated at the time of arrival of the mail and dispatch, voice is outputted with the sound volume which is extent which can hear voice also where it can talk now over the telephone by the handsfree communicate mode and a lug is separated from the loudspeaker for receivers in this handsfree communicate mode. In addition, it can return now to the communicate mode usual by operating the cancellation switch which is not illustrated also in the condition that the handsfree communicate mode at the time of arrival of the mail is set up.

[0017] Moreover, in addition to the usual cellular-phone function, ~~the portable telephone 3 is considered~~

~~as the configuration which is equipped with~~ GPS (Global Positioning System) equipment 4 as a location detection means, and can detect now the location on the earth of self [receiving the signal from at least three PGS satellites (preferably four pieces) 5]. And a portable telephone 3 will transmit this to the nearby thing of base stations 2a-2c as location data periodically, if a location detecting signal is obtained from GPS receiver 4.

[0018] For example, in the condition that the user who possesses a portable telephone 3 drives an automobile 6, and is moving, the location detecting signal of GPS receiver 4 is changing every moment, and can judge the migration condition from the location variation per time amount.

[0019] Next, an operation of this operation gestalt is explained. Drawing 1 is the flow chart which shows the handsfree communicate mode assignment manipulation routine performed to the base station g2a - 2c side, and judges the migration condition by the communication link by the side of a portable telephone 3. Drawing 3 thru/or drawing 5 are the flow charts which show the communications processing by the side of a portable telephone 3, and shows the process of communications processing according to offer of information required for the judgment of a migration condition, and assignment of the handsfree communicate mode.

[0020] The location detection manipulation routine of a portable telephone 3 currently performed in advance of judgment actuation of the migration condition of base stations 2a-2c is explained with reference to drawing 3 . The portable telephone 3 is performing location detection actuation by GPS receiver 4 as mentioned above (step P1), and has transmitted the obtained location detecting signal to the nearby base stations 2a-2c (step P2). This location detection manipulation routine is carried out for every (every [for example,] second) fixed period progress in the state of waiting.

[0021] In base stations 2a-2c, as shown in drawing 1 , in order to judge whether the portable telephone 3 which exists in a self communications area will be in a migration condition, a location detecting signal is first received periodically from a portable telephone 3 (step S1). ~~And passing speed is calculated from the positional information of the past of the received portable telephone 3 (step S2).~~ This calculates the distance which the portable telephone 3 moved between them from the location detecting signal which received before last time or it, ~~and asks for passing speed by $\frac{\text{distance}}{\text{time}}$ by transit time.~~

[0022] Then, base stations 2a-2c ~~judge whether the calculated passing speed is equivalent to the passing speed (for example, 30km [or more]/h) of an automobile, set the handsfree flag for specifying the communicate mode in "YES" to ON (step S4) and in "NO" set a handsfree flag off (step S5).~~

[0023] When it changes from the condition of having judged whether change having produced base stations 2a-2c in the established state of a handsfree flag at this time (step S6), namely, having set up at the time of the last processing, the message of whether to specify it as the handsfree communicate mode to the target portable telephone 3 is transmitted (step S7). Then, it returns to step S1 again, and above-mentioned processing is repeated and carried out.

[0024] In a portable telephone 3, when a message is received at the above-mentioned step S7, as shown in drawing 4 , the display according to the contents of the message which received is performed (steps Q1 and Q2). For example, alphabetic characters and symbols, such as "handsfree assignment", are displayed, and when a user looks at that the condition is changing, it enables it to recognize, when the handsfree communicate mode is specified.

[0025] Next, the manipulation routine at the time of the arrival of a portable telephone 3 is explained with reference to drawing 5 . When base stations 2a-2c have arrival of the mail in the portable telephone 3 which exists in a self communications area, it calls by the handsfree flag to the portable telephone 3 specifying the communicate mode, corresponding [ON or] to whether to be off. For example, when the portable telephone 3 is judged to be in a migration condition and it is necessary to specify it as the handsfree communicate mode, it calls by specifying the handsfree communicate mode preferentially.

[0026] According to this, it judges whether the handsfree communicate mode is specified at the time of arrival of the mail in a portable telephone 3 (step R1), and, in "YES", the handsfree communicate mode is set up (step R2). The ringing of a call is performed in this condition and it stands by that a hook key is operated (step R3). In addition, in this condition, it has judged whether the handsfree communicate mode is canceled by the cancellation switch (step R4).

[0027] If a user operates a hook key and receives a message, a portable telephone 3 will be controlled to talk over the telephone by the handsfree communicate mode (step R5). If a message is completed and a hook key is operated by the ON state, it will come to return to a standby condition. Moreover, when a cancellation switch is operated by the user during a call, it controls to wait to operate "YES", decision), and a hook key at the (step R4, and to talk over the telephone by the usual (step R6) communicate mode (step R7).

[0028] in addition -- arrival of the mail -- the time -- a base station -- two -- a - two -- c -- a side -- from -
- handsfree -- the communicate mode -- assignment -- there is nothing -- a case -- **** -- (-- a step -- R -
- one -- "-- NO -- " -- decision --) -- a portable telephone -- three -- a step -- R -- six -- jumping -- a hook
-- a key -- actuation -- responding -- usual -- the communicate mode -- a message -- carrying out -- as --
controlling .

[0029] Since it considered as the configuration specified that the migration condition of a portable telephone 3 is judged by the base station 2a - 2c side, and it talks over the telephone by the handsfree communicate mode at the time of arrival of the mail according to such this operation gestalt It is under [operation / of an automobile etc.] setting. Irrespective of the established state by the side of a portable telephone 3 A message can be automatically received now in the handsfree communicate mode specified from the convention office 2a - 2c side at the time of arrival of the mail. While it becomes unnecessary for a user to perform a setup in drive mode etc., and a setup of the handsfree communicate mode each time and he secures safety, it can consider as what has good user-friendliness.

[0030] In addition, in the above-mentioned operation gestalt, although the case of a configuration of preparing as a thing of dedication of the cancellation switch formed in a portable telephone 3 was explained, it is good also as a configuration as which a cancellation switch is both [keys / configuration / other] used and is operated. Moreover, the handsfree cancellation function by the cancellation switch can set up not only the cancellation actuation at the time of arrival of the mail but various cancellation modes.

[0031] (2nd operation gestalt) It just constituted so that drawing 6 may show the 2nd operation gestalt of this invention, a different place from the 1st operation gestalt might be replaced with a portable telephone 3 as a location detection means at GPS receiver 4 prepared in one, a portable telephone 8 might receive the location detection information on the car navigation equipment 7 carried in the automobile 6 side and this might be transmitted to base stations 2a-2c.

[0032] In this operation gestalt, the portable telephone 8 is considered as the configuration equipped with the communication link interface whose communication link with the Bluetooth method is attained, and performs the communication link between car navigation equipment 7. Car navigation equipment 7 is considered as the configuration equipped with communication link interface 7d of body section 7a, GPS receiver 7b as a mobile location detection means, display 7c, and the Bluetooth method like illustration.

[0033] Car-navigation equipment 7 displays the path calculated to the destination specified by the user, and performs path guidance to a user with a display, voice guidance, etc. with advance of an automobile while it makes the current position and the location on a map match based on the position signal acquired by GPS receiver 7b and displaying it on display 7c by the control circuit which was established in body section 7a and which is not illustrated.

[0034] If a portable telephone 8 is carried in by the user in an automobile 6, the communication link by the Bluetooth method will be performed from either a portable telephone 8 or car navigation equipment 7, and a network will be formed (a pico network is formed). And the program is incorporated so that it may require that a portable telephone 8 should transmit the location detecting signal periodically detected by GPS receiver 7b from car navigation equipment 7. Car navigation equipment 7 will come to transmit a location detecting signal to a portable telephone 8 according to this, if the demand signal from a portable telephone 8 is received.

[0035] Since it was made to perform information on the current position of a portable telephone 8 using the location detecting signal of GPS receiver 7b of the car navigation equipment 7 carried in the automobile according to such 2nd operation gestalt, a location detecting signal can be obtained certainly,

a migration condition can be judged, and the handsfree communicate mode can specify with the easy configuration which prepares both sides the communication link interface of the Bluetooth method, without doing the troublesome activity of connection of a cable etc.

[0036] In addition, since being standardly carried in various devices in the future is expected, such a communication link interface of the Bluetooth method can be realized, without the configuration which establishes a communication link interface becoming a special thing for attaining this function.

[0037] (3rd operation gestalt) Drawing 7 shows the 3rd operation gestalt of this invention, a different place from the 2nd operation gestalt is replaced with the car navigation equipment 7 as a location detection means for mobiles, and it just considered as the configuration which forms the speed sensor 9 as a migration detection means.

[0038] Sensor section 9a is arranged so that the rotational speed of shaft 6c between the differential gears and transmission 6b which are combined with wheel 6a may be detected, and the speed sensor 9 is constituted so that the detecting signal may be inputted and the vehicle speed may be detected. The communication link interface 10 which communicates by the Bluetooth method is connected to this speed sensor 9, and it communicates like the above-mentioned between portable telephones 8.

[0039] By receiving a vehicle speed signal from the speed sensor 9 with which the cellular phone 8 also carried such 3rd operation gestalt in the automobile 6 side, and transmitting to the nearby base stations 2a-2c, to the base station 2a - 2c side, the migration condition of the target portable telephone 8 can be judged now, and the same effectiveness as **** can be acquired.

[0040] In addition, in the above-mentioned operation gestalt, although the case where a speed sensor 9 was formed was explained, the migration condition of a portable telephone 8 can also be judged after this as a configuration which replaces with a speed sensor 9 and detects the rotational frequency of a wheel, and the migration condition of an automobile is detected from an acceleration sensor etc., and can be judged.

[0041] (4th operation gestalt) Drawing 8 shows the 4th operation gestalt of this invention, and it just used a different place from the 1st operation gestalt as the system applied to the portable telephone 11 and base stations 12a-12c which adopted the W-CDMA method as a communication mode. In the communication link by this W-CDMA method, the signal for range measurement can be transmitted towards the portable telephone 11 which exists from each base stations 12a-12c in each one of communications area 13a - 13c, and that response can detect distance now.

[0042] The location of the portable telephone 11 which is applicable from the distance information detected in three base stations 12a-12c is detectable, using this distance detection function. By repeating and performing this location detection processing with a predetermined time interval, the migration condition of the target portable telephone 11 can be judged.

[0043] According to such the 4th operation carrying, the migration condition of a portable telephone 11 is directly judged by the base station 12a - 12c side, and a message is transmitted, and even when a user forgets to set a portable telephone 11 as drive mode or the handsfree communicate mode by specifying the handsfree communicate mode at the time of arrival of the mail, in an automobilism, it can talk over the telephone by the handsfree communicate mode automatically.

[0044] (5th operation gestalt) A place which drawing 9 shows the 5th operation gestalt of this invention, and is different from the 1st operation gestalt is the approach of judging the migration condition of a portable telephone 3. That is, the configuration in this operation gestalt is a configuration using the portable telephone 3 which is not equipped with GPS receiver 4. In this case, the system of the usual TDMA method may be used and the system of the W-CDMA method in the 4th operation gestalt may be used.

[0045] With this operation gestalt, it is going to judge a migration condition from change of the reinforcement of the signal received from the portable telephone 3 (or portable telephone 11) which exists in the base station 2a - 2c (or base stationsa [12]-12c) side in a communications area. Each base stations 2a-2c calculate variation with the level of the input signal when detecting first the level of the signal received from the target portable telephone 3 (step T1), next receiving in last time or the past, and ask for time fluctuation (step T2).

[0046] If it is judged that it judges whether the variation of the receiving level for which it asked is equivalent to a migration condition (step T3), it is changing quickly, and is equivalent to migration of an automobile, each base stations 2a-2c judge a migration condition (step T four), and when that is not right, it will carry out a return as it is. Thus, if a migration condition is judged, base stations 2a-2c set a handsfree flag to ON (equivalent to step S4 of drawing 1), and when it is not in a migration condition, they will set a handsfree flag to OFF (equivalent to step S5 of drawing 1). Since it is the same as that of the above-mentioned about the following actuation, explanation is omitted.

[0047] Also according to such 5th operation gestalt, base stations 2a-2c can add the user-friendly function for a user, without preparing a special configuration, since it specifies it as the handsfree communicate mode automatically, judging from the variation of signal level which received the migration condition of a portable telephone 3 in being in a migration condition.

[0048] (6th operation gestalt) A place which drawing 10 shows the 6th operation gestalt of this invention, and is different from the 5th operation gestalt is the approach of judging the migration condition of a portable telephone 3. That is, he replaces with judging a migration condition from the variation of the receiving level of the signal from a portable telephone 3, and is trying to judge a migration condition from the variation of the amount of time alignment in this operation gestalt.

[0049] Time alignment here is a function currently generally performed in the communications control of a cellular phone, and is measuring the phase contrast of criteria timing (burst signal receiving timing in a base station), and a receiving burst signal for every slot, and specifying from the measurement result in an absolute value by making transmit timing into the amount of time alignment to a mobile station (portable telephone) in each base stations 2a-2c.

[0050] Now, when judging a migration condition, they start the flow chart shown in drawing 10, and each base stations 2a-2c judge the amount of time alignment first (step W1), calculate a difference with the amount of time alignment of last time or the past, and calculate time amount variation (step W2). Next, it judges whether the variation of the calculated amount of time alignment is equivalent to the migration condition (step W3), in "YES", a migration condition is judged (step W4), and, in "NO", a return is carried out as it is.

[0051] Thereby, like the 5th operation gestalt, base stations 2a-2c can judge the migration condition of a portable telephone 3 from the variation of the amount of time alignment, and they can add the user-friendly function for a user, without preparing a special configuration, since it specifies it as the handsfree communicate mode automatically in being in a migration condition.

[0052] This invention is not limited only to the above-mentioned operation gestalt, and can be transformed and extended as follows. In the above-mentioned operation gestalt, although the case where it applied to a portable telephone was explained, of course, it is also applicable to a land mobile radiotelephone.

[0053] Although the location detection means detected the location and the migration condition is judged, even if it cannot measure a location, if it is the configuration which can measure the movement magnitude per time amount at least, it is enough, and the migration condition by an automobilism etc. can be judged by this.

[0054] In the above-mentioned operation gestalt, although the case where the portable telephone 3 which equipped one with the handsfree function, or 11 was used was explained, it is also applicable to the portable telephone of a configuration of connecting the kit for handsfree separately.

[0055] The cancellation switch described in the 1st operation gestalt can also give the cancellation function at the time of arrival of the mail, and the following various functions. As for this, it is effective to prepare as extension for making it correspond to the busy needs of choosing a partner, making it handsfree, or making [the case where it has not operated even if it is under migration by automobile, and] it the mode of an answering machine for others having ridden together, even if it is under operation, and it being handsfree, and receiving a message, and canceling the message itself.

[0056] That is, the function beforehand set so that handsfree can be canceled once at the time of arrival of the mail may be given, or you may make it cancel handsfree assignment during the period set up by setting up time, or the period which is not set up. Moreover, when carrying out the count (for example, 3

times) call specified at the time of arrival of the mail, it is automatically handsfree and is made to receive a message, and you may enable it to switch to the arrival which cancels handsfree by carrying out switch actuation during a call, and can perform the usual message. Furthermore, it can also set up so that handsfree may be canceled [except the partner who registered as opposed to the partner who registered].

[0057] In each above-mentioned operation gestalt, although only steady operational status is assumed in case a migration condition is judged, the decision under signal halt and a judgment in the case during parking to the road shoulder etc. of having ridden together can be made finely, or a more user-friendly function can also be set up using the communication facility of the Bluetooth method, for example.

[0058] Moreover, in the above-mentioned operation gestalt, although the handsfree communicate mode is set up by the display on a display, you may make it voice report and the announcement to the telephoned side can also be carried out. Furthermore, if handsfree, when there is un-arranging, the function which also enabled it to choose the mode of an answering machine can also be added.

[Translation done.]

* NOTICES *

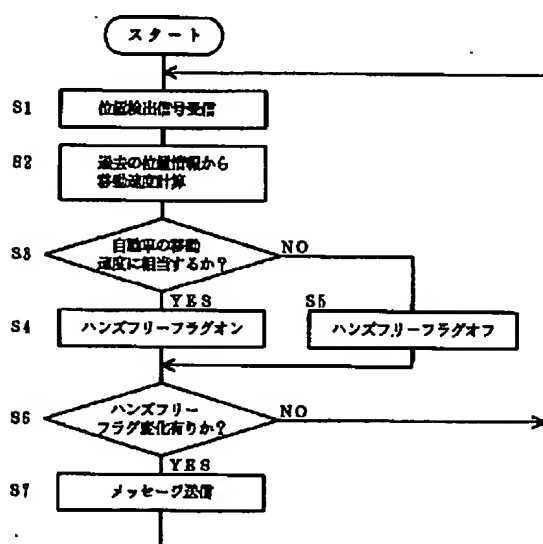
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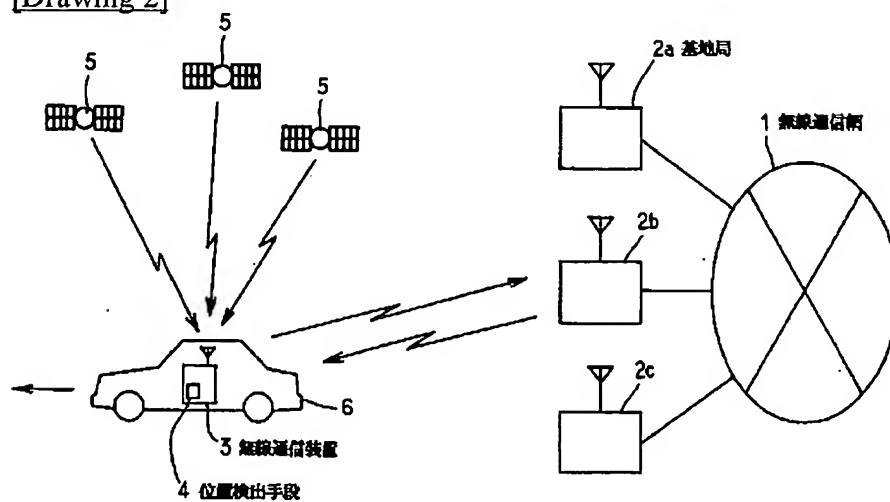
DRAWINGS

[Drawing 1]

ハンズフリーの通信モード判定処理ルーチン

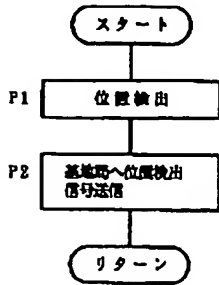


[Drawing 2]



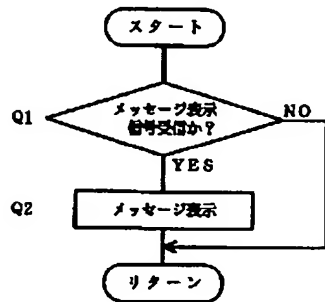
[Drawing 3]

位置検出処理ルーチン (特受状態)



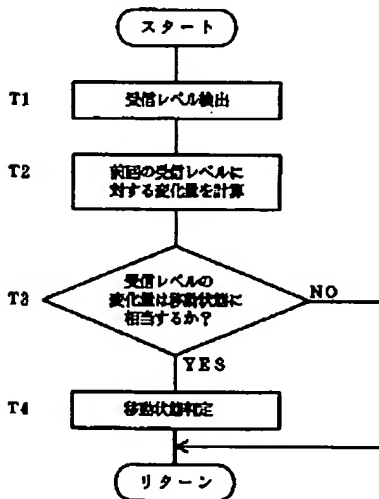
[Drawing 4]

メッセージ表示ルーチン (特受状態)

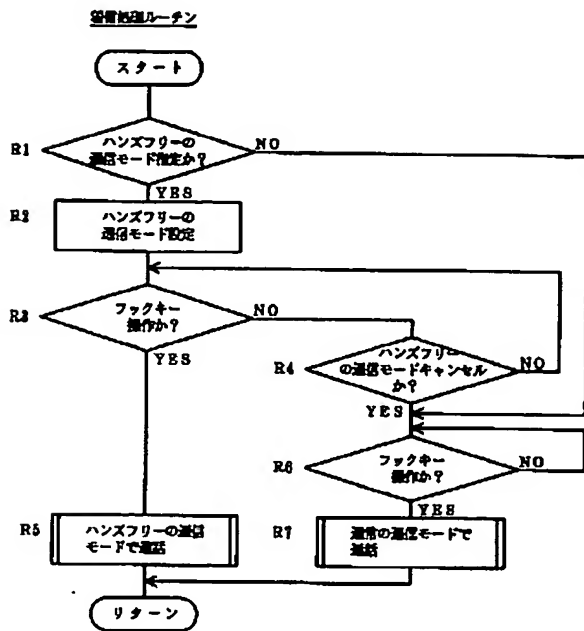


[Drawing 9]

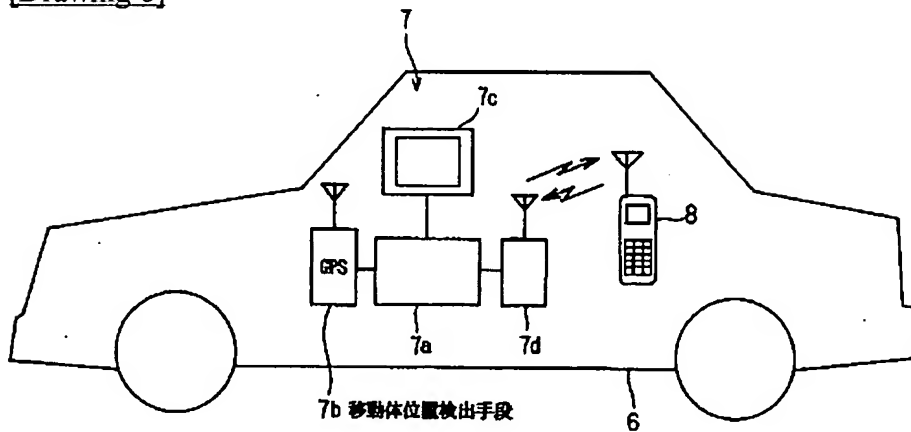
移動状態判定処理



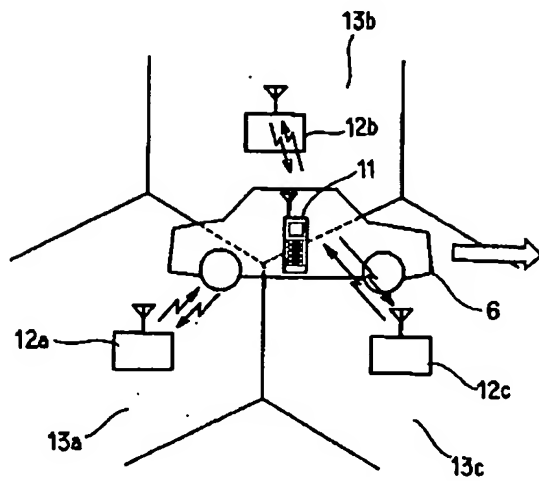
[Drawing 5]



[Drawing 6]

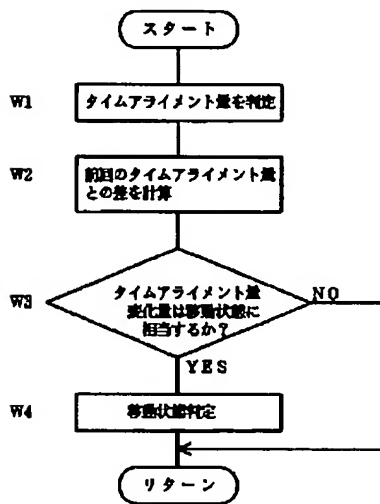


[Drawing 8]

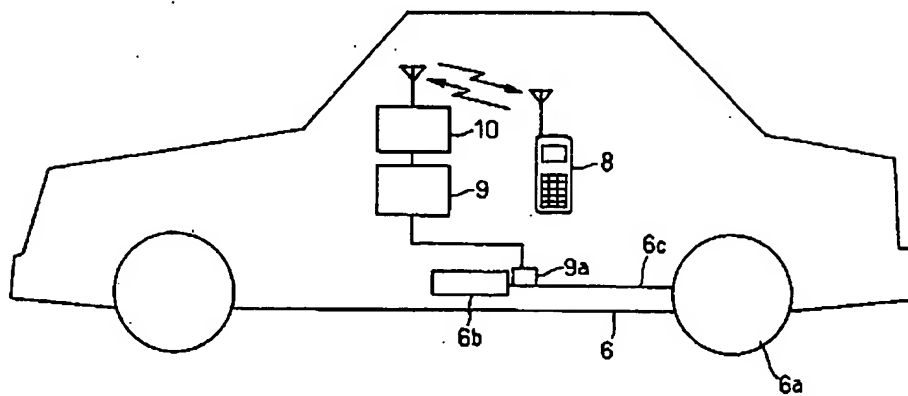


[Drawing 10]

移動状態判定処理



[Drawing 7]



[Translation done.]

PAT-NO: JP02002176678A

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TITLE: WIRELESS COMMUNICATION SYSTEM

PUBN-DATE: June 21, 2002

INVENTOR-INFORMATION:

NAME	COUNTRY
FURUTA, SEIICHI	N/A

ASSIGNEE-INFORMATION:

NAME	COUNTRY
DENSO CORP	N/A

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ABSTRACT:

PROBLEM TO BE SOLVED: To use a mobile phone, without the need for setting a hands-free communication mode on all occasions, when the driver drives an

automobile.

SOLUTION: The mobile phone capable of making a speech in the hands-free communication mode is integrated with a GPS receiver, and periodically transmits its own position information to a base station. The base station obtains a moving speed of the object mobile phone, on the basis of position detection signals received at least twice (S1, S2), sets a hands-free flag, when the moving speed is equivalent to a moving speed of an automobile (S3, S4), and transmits a message denoting a change in the flag setting to the mobile phone (S6, S7). When the mobile phone receives an incoming call, the base station designates the hands-free communication mode to the mobile phone, so as to allow the mobile phone to make a speech in the mode.

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